

Math 2326, Test III

Name _____

1. Find the general solution:

$$w'' - 5w' + 4w = e^{3t}$$

answer: $w(t) = c_1e^t + c_2e^{4t} - \frac{1}{2}e^{3t}$

2. Verify that (30,40) is an equilibrium point of the nonlinear system:

$$\begin{aligned}\frac{dx}{dt} &= -8x^2 - 6xy + 480x \\ \frac{dy}{dt} &= -x^2y - y^3 + 2500y\end{aligned}$$

and classify it as a source, sink, saddle point, spiral source, spiral sink, or center.

answer: Jacobian eigenvalues at (30, 40) are -3339 and -101, so sink.

3. Solve, using Laplace transforms

$$y'' - 5y' + 4y = e^{3t}, \text{ with } y(0) = 0, y'(0) = 0$$

$$\text{answer: } y(t) = -\frac{1}{2}e^{3t} + \frac{1}{3}e^{4t} + \frac{1}{6}e^t$$

4. Find the inverse Laplace transform of $F(s) = \frac{e^{-3s}}{s^2+4}$

$$\text{answer: } f(t) = \frac{1}{2}u_3(t)\sin(2(t-3))$$

5. Solve using Laplace transforms:

$$y' + 4y = 0, \text{ with } y(0) = 3$$

$$\text{answer: } y(t) = 3e^{-4t}$$